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1914. Very little was known in this country as to what use the Germans were making of sphagnum during the war until after the war was over. We now know that they were quite as active, if not more so, in utilizing sphagnum for dressings and other purposes, as the Allies were. Their necessity, of course, came first and their use of this and other material as a substitute for cotton was quite general in some regions, especially on the Russian front.

During the war, Germans made surgical dressings or pads not only of sphagnum moss, but also of common moss, wood pulp, peat, sawdust, wood ashes, peat ashes, hay, straw, surgical lint mixed with different proportions of sphagnum, and even algae and any kind of cellular material that was available.

These materials were usually sewn up in small pillows or muslin sacks, disinfected and used as bandages for wounds that were discharging excessively.

[To be concluded]

REVIEW¹

POTTIER, JACQUES. RECHERCHES SUR LE DEVELOPPEMENT DE LA FEUILLE DES MOUSSES. [Studies on the development of the leaves of mosses.] Pp. 1-137, figs. 1-368, pls. 2. Paris, 1920.

The major part of this work is a detailed description of the cross-sections of moss leaves, longitudinal surface views, and leaf reconstructions in plastiline. The 368 figures are more than sufficient to illustrate the essential features of the text. The indices of the figures are not explained on the various plates or in the "Explication des figures." In order to find out what the indices mean it is necessary to hunt through the text. In *fig. 193* the primordial cells of the conducting tissue are shaded gray, while in other figures gray is used for a different type of cells, an inconsistency that might easily lead to confusion. The bibliography, which includes 43 citations, appears to be incomplete for a subject so often studied, especially so when no American or English papers are included.

In the historical review it is stated that Charles Morren in 1840 was the first to study the development of moss leaves. [Brown, R. Trans. Linn. Soc. 12: 575. 1819, describes the development of the leaves of *Fissidens*, as cited by Salmon.] From 1845-1855, M. J. Schleiden and Carl Nägeli were engaged in a controversy pertaining to the initial development of the leaf. Hofmeister, in 1851, describes the development of young leaves in *Sphagnum* with an initial cell having two faces, with which the formation of leaves in a number of other mosses are compared. In 1863, Lorentz studied the development of the midrib of moss leaves by means of cross-sections and confirms the earlier conclusions of R. Brown with regards to the early development of the leaves of *Fissidens*. [SALMON, E. S. On the genus *Fissidens*. Ann. Bot. 13: 103-130. 1899, also confirms the early conclusions of R. Brown.] In 1867 Lorentz provides the first technical terms for the histological elements of the moss leaf. Leitgeb in 1874

¹ Contribution from the Department of Botany, University of Pittsburgh, No. 3.

did not agree with Lorentz that the less developed side of the duplicate leaf (vaginant lamina) of *Fissidens* is the side which is always in the shade. He thought that the inequality of the leaf parts may be due to the relative position of the leaves in the bud. This conclusion is accepted by Pottier from his studies on various mosses.

The mosses studied by Pottier were fixed in Kaiser's fluid, dehydrated, cleared, and embedded in paraffin. The stained serial sections, mounted in balsam, served as a basis for study. Reconstructions of certain leaves in plastiline or modeling wax were also made from the outlines of cross-sections.

STUDIES OF THE ANDREAEAELES

The initial cell of *Andreaea crassinervia* Bruch has a single face, but the initial cell of *A. angustata* Lindb., with a single face, may be replaced by an initial with two faces. Leaves that have an initial cell with two faces develop a large broad leaf without a midrib; those leaves that have an initial cell of one face usually form a normal acicular leaf with a midrib. The above facts added to the observations of previous investigators indicate that these archaic plants show a tendency toward the type of leaf development found in more recent mosses. [CAMPBELL, D. H. Mosses and Ferns p. 182, 1913, describes the two forms of apical growth of *Andreaea* leaves.] In all the species of mosses studied, Pottier considered asymmetry the result of pressure of one leaf upon another while in the bud. The side of the leaf which is covered reaches a less advanced stage of development.

STUDIES OF THE BRYALES

The most important feature in the study of the leaf of *Mnium undulatum* and *M. punctatum* is the development of the midrib. For the first species, Pottier presents a diagram indicating a leaf cross-section with eight primordial cells arranged in one row. Upon comparing the figures of the actual cross sections of *M. undulatum* leaves figured, in no case is there a section with 8 primordial cells arranged in a single row. The author's theory of development for the midrib of *M. undulatum* is entirely at variance with the actual cross-sections of this moss. The method of development of the midrib as explained for *M. punctatum* will serve equally as well for the first species described. Here two initial cells take part in the formation of the midrib. Each of the initial cells divide by a wall parallel to the surface of the leaf so that in cross section the midrib now shows a group of four cells. The two dorsal cells are divided by a periclinal wall into an outer and an inner cell. From the inner cells by further division is formed the group of small conducting cells, tracheids or stenocysts, that traverse the center of the midrib. The two ventral cells from the group of four cells resulting from the division of the initials, also divide by a periclinal wall into an inner and an outer cell. From the two inner cells by further division is formed a group of large much thickened cells, eurycysts, which serve for strengthening the leaf.

The development of the leaf in *Funaria hygrometrica* is comparable to that

of *Mnium punctatum*. In *Dicranum scoparium* the dorsal protuberances are formed by the swelling of dorsal cells. In *Catharinea undulatum* the margin of the leaf in cross-section consists of 4 cells. In the 2-cell stage the dorsal and ventral cell each divides by an anticlinal wall, perpendicular to the surface of the leaf. The leaf margin is not comparable to the midrib. In *Barbula ruralis* two-thirds the length of a young leaf measuring .05 mm. is the hair point which in cross section is more or less a quadrant of cells. The greatest development of the hair point takes place at the beginning of leaf development. In the cross-section of a *Leucobryum glaucum* leaf a green cell situated more to the dorsal side than the other chlorophyll cells marks the plane of symmetry of the leaf.

The apex and the margin of moss leaves are differentiated first. The process of cell division in moss leaves is transferred from the apex to the base during the progress of development.

W. H. EMIG,
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DUPLICATE SPECIMENS FOR EXCHANGE

Among Members of the Sullivant Moss Society *only*. Return postage, rather than a stamped envelope, should be sent with the request for specimens:

Dr. W. H. Emig, Dept. Botany, University of Pittsburgh, Pittsburgh, Pa.—*Plagiochasma Wrightii* Sull., collected by W. H. Emig, on travertine, Price's Falls, Arbuckle Mts., Okla. (See THE BRYOLOGIST 20: 17, March, 1917).

Dr. John W. Bailey, 4541 Fourteenth Ave., N. E., Seattle, Wash.—*Gymnomitrium obtusum* (Lind.) Pears., Cascade Mts., Snohomish Co., Wash.

Miss Daisy J. Levy, 403 West 115th St., New York City.—*Sphagnum magellanicum* Brid., collected at Farmingdale, N. J., by Miss Daisy J. Levy.

Mr. D. Lewis Dutton, Brandon, Vermont.—*Anthoceros laevis* L., *Umbilicaria pustulata* var. *papulosa* (Ach.) Tuck., and *Sphagnum subsecundum* Nees.

Miss Helen E. Greenwood, 12 Hudson St., Worcester, Mass.—*Odontochisma denudatum* (Mart.) Dum., collected near State College, Pennsylvania, and *O. prostratum* (Sw.) Trev., collected near West Barrington, R. I., both by Miss Helen E. Greenwood.

A CORRECTION

While noticing for THE BRYOLOGIST the second list of Additions to the Flore des Mousses de la Suisse, published by Dr. J. Amann, I regret to have made an awkward error. In the tenth line from the foot of page 29 (Volume 24. 1921.) the statement should read *number of cells per square millimeter*, and not "linear" as printed.

EDWARD B. CHAMBERLAIN